TRMM Surface Backscatter Measurements -- Temporal and Spatial Analysis; Inter-comparison with NSCAT

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Global rainfall is the primary redistributor of earth's energy by the process of latent heat release. This forms the main driving force for the tropical circulation, which in turn impacts the global circulation through transient events such as El Nino. Hence, more precise and long-term time series of the rainfall and its variability is crucial to the understanding and prediction of the global climate and climate change. The Precipitation Radar (PR) abroad the US/Japan Tropical Rainfall Measuring Mission (TRMM) is the first radar ever launched into space that measures detailed vertical profiles of rain intensity over the tropics.

One of the challenges in estimating rainfall from spaceborne radars is the presence of attenuation at frequencies, such as 14 GHz of the TRMM PR and future planned systems at this and higher frequencies. A common approach in current rainfall retrieval algorithms is to employed the path integrated attenuation (PIA) as a constraint to the retrieval, and hence overcome errors in the radar calibration or in the assumed rainfall parameters. PIA can either be derived from a radiometer or from the surface reference technique, in which a clear air radar measurement is compared with the measurement in the raining area. The current TRMM 2A21 PIA data product makes use of both a temporal and spatial clear air database for comparison to rainy measurements.

In this paper we present results from analysis of TRMM surface backscatter cross-section (sigma0) measurements from Nov 97-Feb99, and a comparison with sigma0 measurements obtained by the NASA Scatterometer (NSCAT) between Sept96-June97. Measurements for a given month from both instruments are compiled on a 1 deg. (lat.) x 1 deg. (lon.) x 1 hr. grid. This enables TRMM--NSCAT comparison and the investigation of seasonal and diurnal trends in both data sets. From preliminary analysis of TRMM sigma0's we have decided not to treat the ocean as a single homogeneous region but to select a number of ocean sub-regions and individually analyze their trends. Likewise, and in a similar approach to previous studies of Seasat over-land data, we have selected a number of over-land regions for study. From said sigma0 maps and regional trend analysis we investigate possible sources of trends and variability. In addition, we study the effects of TRMM PR sensitivity through the PR "possible rain" class.

Given NSCAT's inability to flag rain contaminated measurements we are able to gauge the impact of rain contamination on NSCAT monthly sigma0 maps, using TRMM measurements.

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